

(19) World Intellectual Property  
Organization  
International Bureau



(43) International Publication Date  
4 December 2003 (04.12.2003)

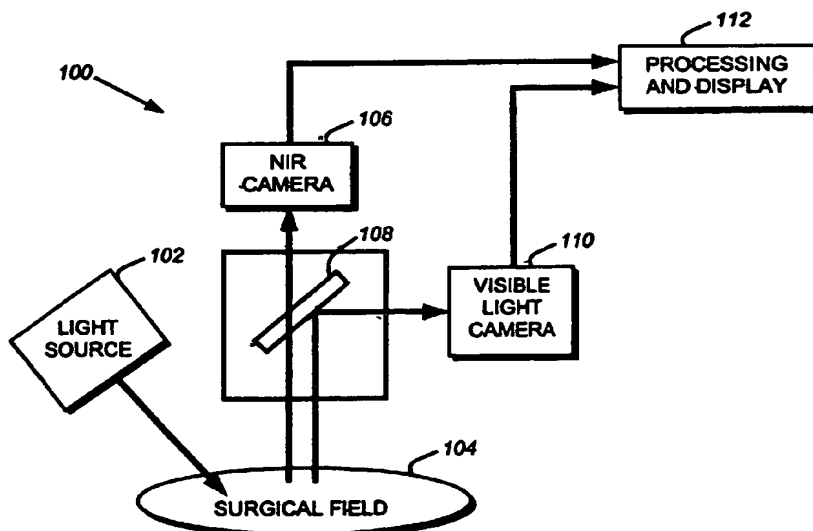
PCT

(10) International Publication Number  
**WO 2003/100925 A3**

- (51) International Patent Classification<sup>7</sup>: **A61B 5/00**, 1/04, 5/103, G01N 21/47, 21/64
- (21) International Application Number:  
PCT/US2003/016285
- (22) International Filing Date: 22 May 2003 (22.05.2003)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data: 60/382524 22 May 2002 (22.05.2002) US
- (71) Applicant (for all designated States except US): **BETH ISRAEL DEACONESS MEDICAL CENTER [US/US]**; 330 Brookline Avenue, Boston, MA 02215 (US).
- (72) Inventor; and
- (75) Inventor/Applicant (for US only): **FRANGIONI, John V. [US/US]**; 34 Wayland Hills Road, Wayland, MA 01778 (US).
- (74) Agents: **MAZZARESS, Robert A. et al.**; Ropes & Gray LLP, One International Place, Boston, MA 02110-2624 (US).
- (81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.
- (84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).
- Published:  
— with international search report

[Continued on next page]

(54) Title: DEVICE FOR WAVELENGTH-SELECTIVE IMAGING



(57) Abstract: An imaging device captures both a visible light image and a diagnostic image, the diagnostic image corresponding to emissions from an imaging medium within the object. The visible light image (which may be color or grayscale) and the diagnostic image may be superimposed to display regions of diagnostic significance within a visible light image. A number of imaging media may be used according to an intended application for the imaging device, and an imaging medium may have wavelengths above, below, or within the visible light spectrum. The devices described herein may be advantageously packaged within a single integrated device or other solid state device, and/or employed in an integrated, single-camera medical imaging system, as well as many non-medical imaging systems that would benefit from simultaneous capture of visible-light wavelength images along with images at other wavelengths.



— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

**(88) Date of publication of the international search report:**  
15 April 2004

## INTERNATIONAL SEARCH REPORT

International Application No.

/US 03/16285

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 A61B5/00 A61B1/04 A61B5/103, G01N21/47 G01N21/64

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 A61B G01N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, PAJ

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 807 026 A (NISHIOKA KIMIHIKO ET AL) 21 February 1989 (1989-02-21)  column 7, line 4 - column 10, line 22; figures 10,12 -----	1,5,9, 10,12, 13,15, 16,18, 21,25, 26,29,30
X	EP 1 177 761 A (FUJI PHOTO FILM CO LTD) 6 February 2002 (2002-02-06) paragraphs [0103] - [0116]; figure 6 -----	1,29,30
X	US 5 474 910 A (ALFANO ROBERT R) 12 December 1995 (1995-12-12) column 4, line 52 - column 5, line 24; figure 3 ----- -/--	1,9,17

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

## \* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- "&" document member of the same patent family

Date of the actual completion of the international search

9 October 2003

Date of mailing of the international search report

24 02 2004

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax: (+31-70) 340-3016

Authorized officer

Kronberger, R

# INTERNATIONAL SEARCH REPORT

International Application No.

783 03/16285

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 061 591 A (DANKWART-EDER FRANZ ET AL) 9 May 2000 (2000-05-09) column 1, lines 23-28 column 6, line 40 - column 8, line 3 -----	1,7,8
A	US 2002/049386 A1 (MULLER PAUL J ET AL) 25 April 2002 (2002-04-25) paragraphs [0003], [0040] - [0051] -----	1,5,7,8, 10

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US 03/16285

## Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:  
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:  
1, 5 and 7-26 (in part, dependent on 1), 29+30

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

BEST AVAILABLE COPY

## FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1, 5 and 7-26 (in part, dependent on 1), 29+30

A system comprising a device that captures photon intensity from an illuminated object through a filter wheel to form a visible light image and a diagnostic image, the diagnostic image corresponding to emissions from an imaging medium within the object; and a method using this system.

---

2. claims: 2, 5 and 7-26 (in part, dependent on 2), 29+31

A method/system comprising a plurality of devices that capture photon intensity from an illuminated object through filters and beam splitters to form a visible light image and a diagnostic image.

---

3. claims: 3, 5-26 (in part, dependent on 3), 29+32, 29+33

A method/system to form a visible light image and a diagnostic image whereby the devices that captures photon intensity has a plurality of pixel locations with filters for selective wavelength transmission.

---

4. claims: 4, 5-26 (in part, dependent on 4), 29+34

A method/system to form a visible light image and a diagnostic image whereby the devices that captures photon intensity has a plurality of pixel locations with diode junctions for selective wavelength detection.

---

5. claims: 27, 28

A system to form a visible light image and a diagnostic image whereby the images are captured in digital form.

---

## INTERNATIONAL SEARCH REPORT

Information on patent family members

PCT/US 03/16285

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 4807026	A	21-02-1989	JP 2679014 B2 JP 62217216 A US RE34411 E	19-11-1997 24-09-1987 19-10-1993
EP 1177761	A	06-02-2002	JP 2002045330 A EP 1177761 A2 US 2002014595 A1	12-02-2002 06-02-2002 07-02-2002
US 5474910	A	12-12-1995	NONE	
US 6061591	A	09-05-2000	DE 19612536 A1 EP 0805348 A2 JP 10014857 A	02-10-1997 05-11-1997 20-01-1998
US 2002049386	A1	25-04-2002	AU 9359201 A WO 0228273 A2 CA 2424894 A1	15-04-2002 11-04-2002 11-04-2002

BEST AVAILABLE COPY